The Pathorganic Project – Evaluating And Reducing Risks Regarding Human Pathogens In Organic Fresh Produce

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THE PATHORGANIC PROJECT – EVALUATING AND REDUCING RISKS REGARDING HUMAN PATHOGENS IN ORGANIC FRESH PRODUCE

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Introduction

As consumers strive to eat healthy diets, they show an increasing demand for uncooked and minimally processed vegetables preferentially from organic production lines. At the same time, outbreaks of disease have been traced back to the consumption of fresh plant produce contaminated with enteric pathogens. Controversy exists on whether food safety is more at risk in organic versus conventional production of plant produce. The increased use of raw manure for fertilization in organic production may constitute an elevated risk of transferring human pathogens from livestock onto vegetables. On the other hand, it has been argued that the buffering capacity against invading microbes may be significantly improved in organic soils thanks to the more diverse and active microflora. The PathOrganic project evaluates potential risks associated with the consumption of organically produced vegetables, taking into account various fertilization practices.

Methods

Large-scale surveys were performed in Austria, Germany, Switzerland, Sweden and Denmark, with additional expertise coming from research groups in the Netherlands. Information on the use of organic manures as fertilizers in organic vegetable production in the individual countries served as a basis for the development of a sampling strategy for the analysis of animal manures and of organic vegetables subsequently grown on the fertilized fields. Approximately 40 organic vegetable farms were approached in each country and data referring to specific management practices were collected through the use of a questionnaire. Organic manures were analyzed for the prevalence of *E. coli*, *Salmonella*, *Staphylococcus*, *Listeria* and *Campylobacter*. *E. coli* counts were done and standard ISO-methods were applied for detecting food-borne pathogens. Microbial DNA preparations from the samples were distributed among the participating labs, which were each specialized in specific analyses. A corresponding sampling and analysis scheme was applied to the screenings of vegetables. Because of congruency with cultivation-dependent analyses and higher detection sensitivity, only molecular methods were used for analyzing plant produce.

Results and Discussion

While detection of *E. coli* in almost all manure samples was not unexpected, a considerable amount of samples proved positive also for *Campylobacter*, *Listeria* and *Staphylococcus.* 15% of the *E. coli*-positive cases gave indications for the presence of enterohaemorrhagic *E.coli* (EHEC) based on PCR-detection of specific virulence genes (Fig. 1). *Salmonella* was detected sporadically in manures from Austria and Switzerland but not from the Nordic countries.

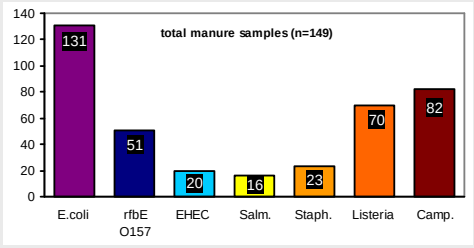

Fig. 1. Bacterial pathogens in manure samples collected in five European countries based on PCR detection of marker genes.

Vegetables from farms where manures had evidenced a risk of being contaminated with human pathogens were collected and analyzed for the same pathogens as had been studied in the manures. A coherent scheme for both sampling and analysis was developed which concentrated on screening spinach and lettuce plants.

The surveys conducted within PathOrganic serve as tools to determine "critical control points", depicting steps at which control can be applied to prevent or eliminate a food safety hazard. Critical factors suggesting a problem concerning food safety will be analyzed in greenhouse and field experiments. In addition, a quantitative risk assessment model will be further developed. During a final workshop critical control points and recommendations will be discussed with stakeholders, and project results will be communicated to end-users via a brochure (Fig. 2). Guidelines deriving from the project results shall allow producers to better control bacterial contamination of organically grown vegetables.

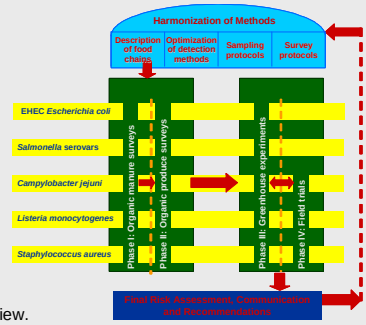

Fig. 2. Project overview.

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